Section 859—Guard Rail

859.1 General Description

This section includes the requirements for guard rail components, such as:

- Guard rail elements, terminal sections, and fittings
- Cable end anchor assemblies
- Steel guard rail posts and offset blocks
- Wood guard rail posts and offset blocks

859.1.01 Related References

A. Standard Specifications

Section 106—Control of Materials

Section 863—Preservative Treatment of Timber Products

B. Referenced Documents

ASTM		AASHTO
A 123/ A 123M A 153/ A 153 M A 449 A 575 A 576 A 709/A 709M	A 741 A 769/A 769M B 209 (B 209M) B 211 (B 211M) F 568	M 180

1994 SPIB rules, paragraph 402

QPL 8

859.2 Materials

859.2.01 Guard Rail Elements, Terminal Sections, and Fittings

A. Requirements

1. Steel Guard rail

   Use guard rail parts that meet AASHTO M 180 requirements and are composed of the following elements:

Bridge railing	Class B, Type II beams
Roadway guard rail	Class A, Type II beams

   Use guard rail from suppliers found on QPL 8.

2. Aluminum Guard Rail

   Use rail elements made from aluminum alloy alclad 2024-T3 sheet that meets ASTM B 209 (B 209M) requirements. Use the following fittings:

Fittings	Material Requirements
Aluminum bolts	Alloy 2024-T4 [ASTM B 211(B 211M)] with 30-minute anodize and 30-minute seal
Hex nuts	Aluminum alloy 6061-T6, not anodized
Washers	May meet ASTM B 209 (B 209M) Alclad 2024-T4, not anodized

3. Certification

   Submit a certification as in Subsection 106.05, “Materials Certification.”

B. Fabrication

1. General
   a. Make highway guard rail elements according to the Plans.
   b. Ensure that all guard rail elements, terminal sections, and fittings are interchangeable with similar parts, regardless of the source or manufacturer.
   c. If constructing guard rail on curves with a radius of 150 ft (45 m) or less, curve the rail elements in the shop to the radius on the road side of the rail, either concave or convex, as required.
2. Aluminum Guard Rail Elements
   a. Form the rail elements into beams at least 1 ft (300 mm) wide and 3 in (75 mm) deep, and at least 0.156 in (3.96 mm) thick.
   b. Form the terminal ends from the same material as the beams or from Alclad 2024-T42.

C. Acceptance

1. Steel Guard Rail

   The Department will accept the material based on the provisions of AASHTO M 180 or ASTM B 209 (B 209M).
2. Aluminum Guard Rail

   The Department will accept the material based on the manufacturer's QPL status or on tests conducted by the Department.

D. Materials Warranty

Steel Guard Rail: Ensure that the manufacturer's logo and heat numbers remain legible for at least 5 years after galvanizing.

859.2.02 Cable and Anchor Assembly

A. Requirements

1. Type

   Ensure that the cable and anchor materials meet the following requirements, unless shown otherwise on the Plans:

Material	Requirements
Anchor and metal plates	Steel, ASTM A 709 (A 709M), Grade 36 (250)
Anchor rod	Steel, ASTM A 575 or A 576, Grade 1020
Anchor cable	Preformed, galvanized wire rope, ASTM A 741, Type II, 3/4 in (19 mm), 6 x 19, with right regular lay
Cable clips and cable thimble	Commercial quality, galvanized, drop-forged steel
Bolts and nuts	ASTM F 568
Swaged fittings	Steel, ASTM A 576, Grade 1035; annealed, galvanized, suitable for cold swaging Ensure the swaged fittings and stud assembly develop at least 100% of the breaking strength of the cable.
Galvanized stud	Steel, ASTM A 449
Concrete deadman	Precast Class A concrete, according to the Plans

2. Certification

   Submit a certification for these materials according to Subsection 106.05, "Materials Certification."

B. Fabrication

Fabricate and assemble according to the Plans.

1. Anchor/Metal Plates

   Build up anchor plates and other metal plates, as shown on the Plans, or form them on a press, with or without welded seams.

2. Anchor Rod

   Drop-forge or form the eye of the anchor rod with a full penetration weld that develops 100 percent of the rod strength.

3. Metal Components:

   a. Galvanize all metal components of the assembly, except the anchor cable, according to ASTM A 123/A 123M.

   b. Galvanize bolts, washers, etc., as stated in ASTM A 153/A 153M.

C. Acceptance

The Department will accept material based on the certification.

D. Materials Warranty

General Provisions 101 through 150.

859.2.03 Steel Guard Rail Posts and Offset Blocks

A. Requirements

1. Type

   Use steel posts of the dimensions and shapes shown on the Plans for guard rails. Unless the Plans show otherwise, use posts that meet the requirements of ASTM A 709 (A 709M), Grade 36 (250) or ASTM A 769 (A 769M) Class I, Grade 40 (380), and found in QPL 8.

2. Certification

   Submit a certification according to Subsection 106.05, "Materials Certification."

B. Fabrication

Galvanize steel posts and offset blocks according to ASTM A 123/ A 123M.

C. Acceptance

The Department will accept the material based on the certification.

D. Materials Warranty

General Provisions 101 through 150.

859.2.04 Wood Guard Rail Posts and Offset Blocks

A. Requirements

1. Grade

   Use posts and offset blocks that meet the requirements for No. 1 timbers, paragraph 402, of the 1994 SPIB rules.

   Do not use offset blocks with splits longer than 3 in (75 mm).

B. Fabrication

1. Tolerances

   Ensure that the posts do not vary from the specified length by more than ± 1 in (± 25 mm). If the Plans specify a slope for the top, ensure that the slope does not vary more than ±1/4 in (± 6 mm).

2. Seasoning and Preservative Treatment

   Bore and frame posts, then treat the posts and offset blocks according to the requirements of Section 863.

C. Acceptance

The Department will accept the material based on tests conducted by the Department or on the manufacturer's QPL status.

D. Materials Warranty

General Provisions 101 through 150.

859.2.05 Plastic Offset Blocks

A. Requirements

1. Type

   Use only plastic offset blocks that are listed on QPL 8.

Use plastic offset blocks that consist of 70 percent low density polyethylene and approximately 30 percent high density polyethylene with a trace of other plastic.

Other compositions may be used if approved by the Office of Materials and Research.

2. Certification

Submit a certification according to Subsection 106.05, "Materials Certification."

B. Fabrication

General Provisions 101 through 150.

C. Acceptance

The Department will accept the material based on the manufacturer's certification.

D. Materials Warranty

General Provisions 101 through 150.

Section 860—Lumber and Timber

860.1 General Description

This section includes the requirements for lumber and timber.

860.1.01 Related References

A. Standard Specifications

Section 502, "Timber structures"

Section 863—Preservative Treatment of Timber Products

B. Referenced Documents

American Softwood Lumber Standard PS 20-70, US Department of Commerce or the National Hardwood Association

ASTM D 245

860.2 Materials

For the definition and limitations of defects, use the current manufacturing association grade rules applicable for the species specified.

860.2.01 Lumber and Timber

A. Requirements

1. Saw or finish all lumber and timber as specified from the plants listed in QPL 50.
2. Grades

   Use grade rules from an agency that follows the basic provisions of American Softwood Lumber Standard PS 20-70, US Department of Commerce or the National Hardwood Association.

   a. Furnish all structural timber in the grades, sizes, and finish shown in the Plans and these Specifications, or as directed by the Engineer.

   b. Unless otherwise specified, use No. 2 or higher grade Southern Pine to construct buildings, shelving, and forms.

   c. Mark the grade on the lumber or timber according to the current manufacturing grade rules for the species.
3. Uses

   Refer to Table 1 below for the working stress requirements for various structural uses of lumber and timber.

   a. The numerical stress values in the table are based upon stress-graded material meeting the requirements of grading rules for the indicated stress, developed from the ASTM D 245, "Methods for Establishing Structural Grades of Lumber."

   b. You may use commercial stress grades of lumber and timber with grade descriptions if the materials will meet the stress requirements under rules developed from ASTM D 245.